# NRC Schedule (CICT) - 1 of 3

Tuesday, June 11

| | | |
|---|---|---|
| 8:30 am | PRT Overview | Venneri & Hanks |
| 9:45 am | Brief Overview of ECT | Moore |
| 10:15 am | Brief Overview of CICT | Tu |
| 10:45 am | Brief Overview of ECS | Gawdiak |
| 11:15 am | Open Q&A | |
| | | |
| 1:00 pm | CICT Program Overview | Tu & Van Dalsem |
| 1:45 pm | CICT/IS Overview | Hine |
| 2:45 pm | Automated Reasoning | Morris |
| 3:30 pm | Human Centered Computing | Shafto |
| 4:15 pm | Intelligent Data Understanding | Coughlan |
| 5:00 pm | Open Q&A | |

# NRC Schedule (CICT) - 2 of 3

Wednesday, June 12

| | | |
|---|---|---|
| 8:30 am | CNIS Overview | Yan |
| 9:00 am | Computing Testbed Research | Biswas |
| 9:15 am | Networking Testbed Research | Freeman |
| 9:30 am | Grid Common Services | Johnston |
| 9:45 am | Information Environment | Mehrotra |
| 10:00 am | Grand Challenge Applications | Yan |
| | | |
| 10:30 am | Space Communications | Bhasin |
| 10:55 am | Architectures | Bhasin |
| 11:10 am | High Rate Space Backbone and Access Networks | Wald |
| 11:30 am | Inter-Spacecraft Networks | Hayden |
| 11:45 am | Wireless Proximity Networks | Yan |

# NRC Schedule (CICT) - 3 of 3

Wednesday, June 12

| | | |
|---|---|---|
| 1:00 pm | ITSR Overview | Alfano |
| 1:20 pm | High Confidence Software | Lowry |
| 1:40 pm | Intelligent Controls and Diagnostics | Totah |
| 2:00 pm | Bio/Nano Technology | Partridge |
| 2:25 pm | Revolutionary Computing Algorithms | Toomarian |
| 2:35 pm | Evolvable Systems | Lohn |
| 3:00 pm | Open Q&A | |

Thursday, June 13

| | |
|---|---|
| 8:30-noon | CICT Demos and Tours |

# Computing, Information, and Communications Technology (CICT) Program Overview

***NRC Review***
***June 2002***
***NASA Ames Research Center***

COMPUTING INFORMATION & COMMUNICATIONS TECHNOLOGY

# Outline

- Requirements
  - National and Federal Initiatives
  - NASA Mission Requirements
  - Technology Challenges
- Program Overview
  - Goals
  - Technical Objectives
  - Major Deliverables
  - Project Organization
- Program Strategy
  - Investment Strategy
  - Program Level Customers
- Program Management
  - Management Organization
  - Management Structure
  - Program Level Processes
- Schedule and Budget

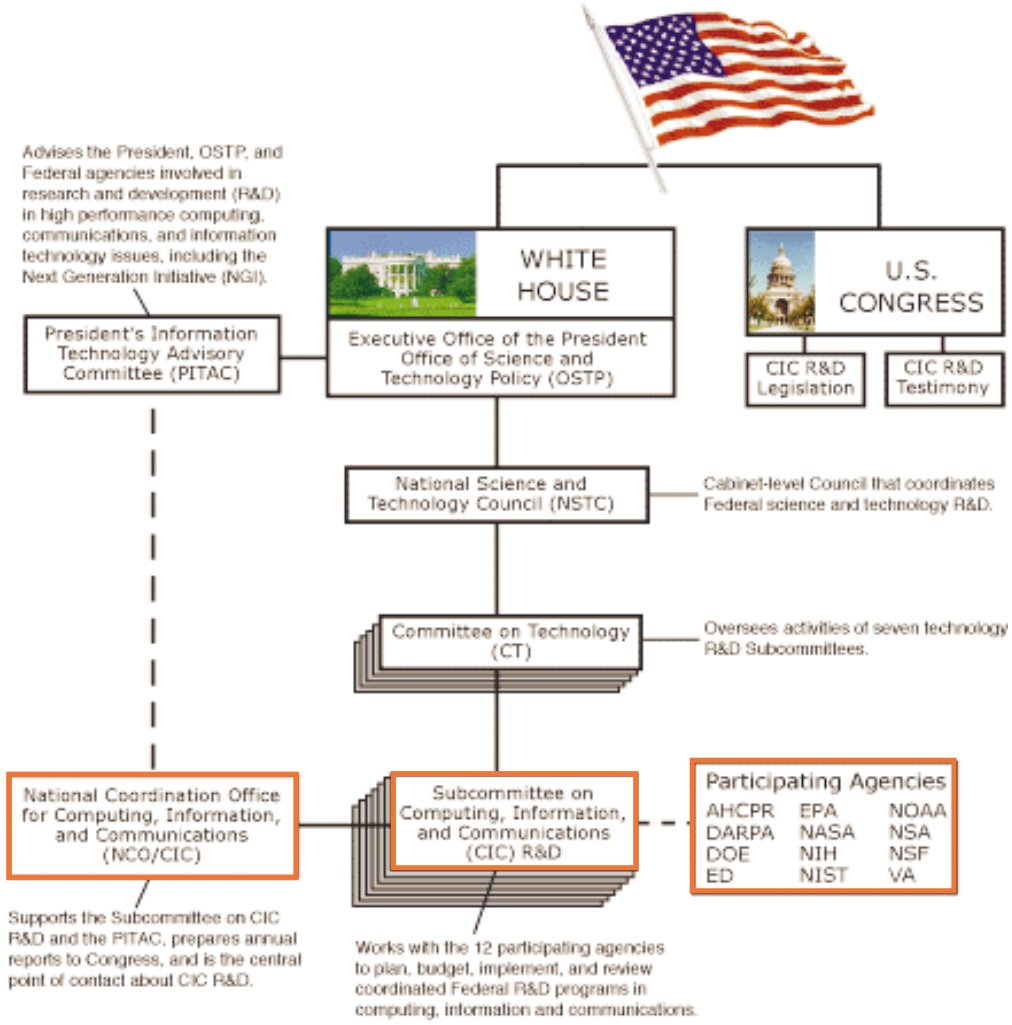


# Requirements

# National and Federal Initiatives
# NASA Missions
# Technology Challenges

# Federal CIC Oversight Structure

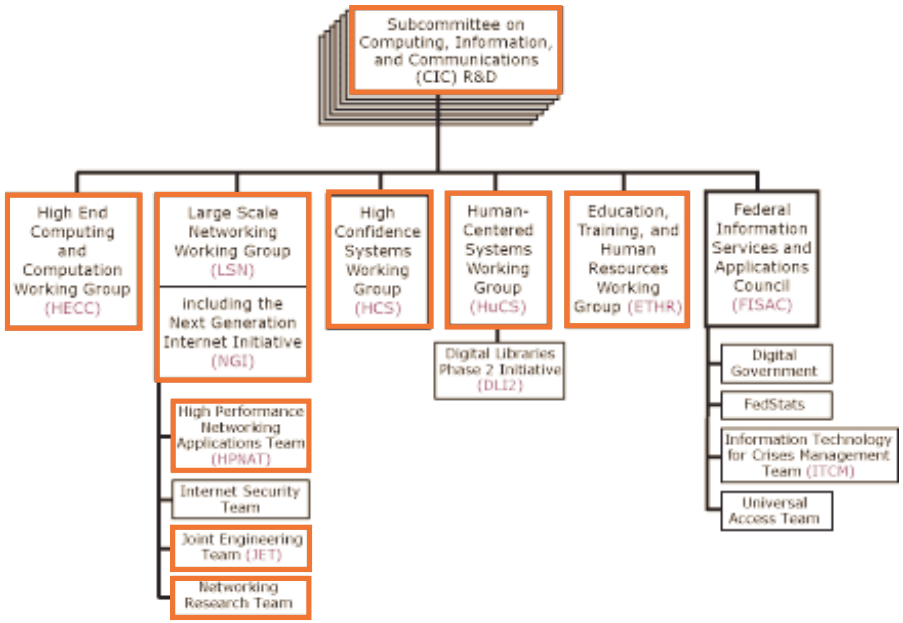
(continued)




NASA Participation

# Federal CIC Oversight Structure

(concluded)




HECC Provides the foundation for U.S. leadership in high end computing and promotes the use of high end computing and computation in government, academia, industry, and in broad societal applications

LSN Helps assure U.S. technological leadership in high performance network communications through research that advances the leading edge of networking technologies, services, and performance

HCS Focuses on critical technologies necessary to achieve high levels of availability, reliability, security, protection, and restorability of information services

HuCS Leads to increased accessibility and usability of computing systems and communications networks

ETHR Supports computer- and communications-related research to advance education and training technologies at all levels

FISAC Stimulates and fosters the migration of technology developed by the information technologies R&D community to Government application missions and information services communities, and identifies and communicates challenges that came from applications and services communities to the information technologies R&D community

NASA Participation

# National Information Technology Agenda

## Information Technology Research: Investing in our Future

**President's Information Technology Advisory Committee Report to the President**
**National Coordinating Office for Computing, Information, and Communications**
**February 29, 1999**

***Recognizes solid foundation but identifies gaps in national IT investment***

***Proposes augmentation to ongoing activities to address gaps identified by PITAC***

## Networking and Information Technology Reseacrh and Development (Blue Book)

**Supplement to the President's Budget for FY2002**

***Addresses research challenges and coordinated Federal investments and approach***

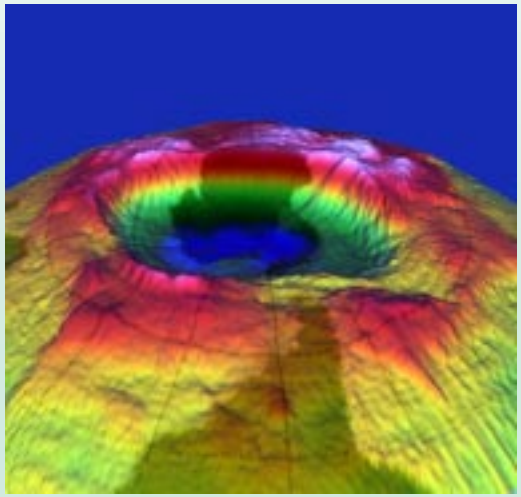
# The NASA Mission

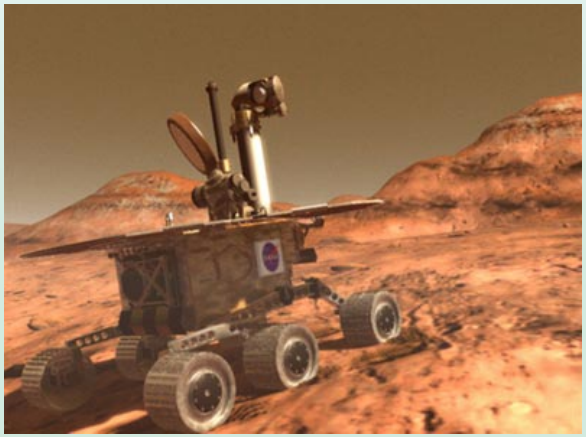
***To understand and protect our home planet***

***To explore the Universe and search for life***

***To inspire the next generation of explorers***

***Sean O'Keefe***
***NASA Administrator***
***April 12, 2002***





# NASA Mission
# - Technology Challenges -

***To understand and protect our home planet***

***To explore the Universe and search for life***

**Technologies which will allow decreases in size and weight, increases in robustness, and increases in scientific return of our Earth sensing and space exploration missions:**

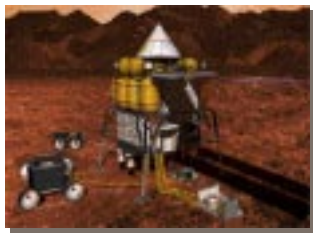
- Autonomous and adaptive systems
- Space communications
- Bio/Nanotechnology electronics, sensors, and structures

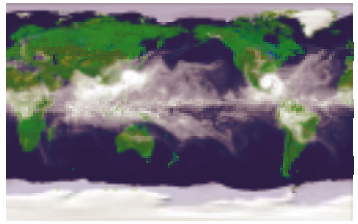
**Technologies to multiply the effectiveness of NASA's Aerospace, Earth observation and space exploration missions:**

- Data analysis and simulation software
- Scientific collaboration technologies
- Human-centered systems technologies
- Software synthesis and verification
- Communications and computing architectures

***To inspire the next generation of explorers***

**Computing, information, and communication (CIC) technologies to put NASA's engineering and scientific endeavors within a "key-stroke" of the entire NASA engineering and scientific team, educators, students and the American public**





# NASA Strategic Plan

*Computing, Information and Communications Technologies are critical to NASA Missions*



Summary: NASA High Level Roadmap—Contributors to National Priorities

NASA is an investment in America's future. As explorers, pioneers, and innovators, we boldly expand frontiers in air and space to inspire and serve America and to benefit the quality of life on Earth.

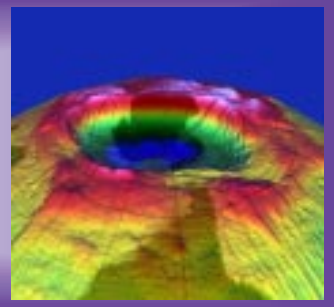
| Agency Mission | Enterprises | Near-term Plans 2000–2005 | Mid-term Plans 2006–2011 | Long-term Plans 2012–2025 | Contributors to National Priorities |
|---|---|---|---|---|---|
| | Space Science | | | | Increase the Understanding of Universe and Technology |
| | Earth Science | | | | Protect the Environment |
| | Biological and Physical Research | | | | Create Education Excellence |
| | Human Exploration and Development of Space | | | | Peaceful Exploration and Discovery |
| | Aerospace Technology | | | | Economic Growth and Security |

Note:

# NASA Mission: Scientific Research

*Mission:*

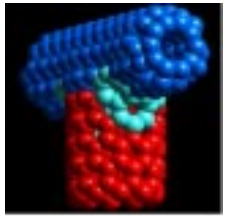
To advance and communicate scientific knowledge and understanding of the Earth, the solar system, and the universe



## *Space Science Enterprise:*

"…reap benefits of technology investments, including biological, information, and nanotechnology systems"

"…enable a virtual presence for autonomous scientific discovery"



## *Earth Science Enterprise:*

"…implement autonomous satellite control…"

"…deploy cooperative satellite constellations, intelligent sensor webs…"

"…employ distributed computing and data mining techniques for Earth system modeling"

# NASA Mission: Space Exploration

*Mission:*

To advance human exploration, use, and development of space

*Biological and Physical Research Enterprise:*

"…extend our understanding of chemical, biological, and physical systems"

*Human Exploration and Development of Space Enterprise:*

"…establish robotic/engineering "outposts" at key sites…"

"…extend scientific discovery on missions of exploration through the integrated use of human and robotic explorers"

"Invest in the development of high-leverage technologies to enable safe, effective and affordable human/robotic exploration."

# NASA Mission: Aerospace Technology Development

*Mission:*

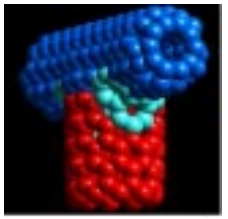
To research, develop, verify, and transfer advanced aeronautics and space technologies

## Aerospace Technology Enterprise:

"… develop processes and technology improvements to support safer crewed launches…"

"… develop advanced engineering tools, processes, and design environments…

"… pioneer basic research in revolutionary technologies such as nanotechnology, information technology, and biotechnology."

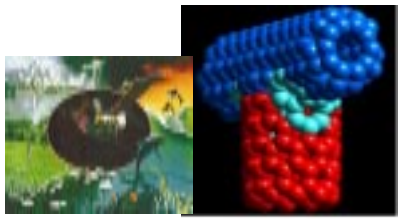



# NASA Mission
# CICT Technology Requirements

NASA Mid- and Long-Term Mission Plans are reliant on the availability of advanced information technologies:

– Smarter more intelligent, collaborative systems including:
  - *Autonomous spacecraft control and scientific discovery*
  - *Intelligent sensorwebs and cooperating constellations*
  - *Integrated human/robotic explorers*

– Advanced computing and communication systems including:
  - *Breakthrough science and engineering simulation capabilities*
  - *Mobile, distributed analysis, data mining, and collaboration capabi*
  - *Pervasive Earth-to-deep space NASA web technologies to suppor robotic and human exploration*



– Information Technology Strategic Research, including:
  - *Intelligent controls and diagnostics*
  - *Evolvable systems*
  - *High confidence software*
  - *Biotechnology and nanotechnology*
  - *Revolutionary computing concepts*

QuickTime™ and a Photo - JPEG decompressor are needed to see this picture.

# CICT

## Goals
## Technical Objectives
## Major Deliverables
## Projects

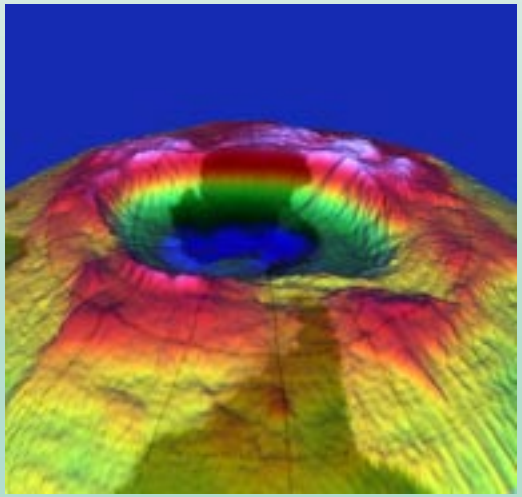
COMPUTING INFORMATION & COMMUNICATIONS TECHNOLOGY

# CICT Program Goal

**Enable NASA's Scientific Research, Space Exploration, and Aerospace Technology Missions**

**with greater mission assurance, for less cost, with increased science return**

**through the development and use of advanced computing, information and communications technologies.**



# CICT Program Technical Objectives

## Goal-directed systems

***Enable smarter, more adaptive systems and tools that work collaboratively with humans in a goal-directed manned to achieve NASA's twenty-first century mission/science goals.***

## Seamless access to NASA information technology resources

***Enable seamless access to ground-, air-, and space-based distributed hardware, software, and information resources to enable NASA missions in aerospace, Earth science, and space science.***

## High-rate data delivery

***Enable broad, continuous presence and coverage for high-rate data delivery from ground-, air-, and space-based assets directly to the users.***

## Strategic research

***Research, develop, and evaluate a broad portfolio of fundamental information and bio/nano-technologies for infusion into future NASA missions.***

# CICT Program Objectives
## - Goal-Directed Systems -

***Enable smarter, more adaptive systems and tools that work collaboratively with humans in a goal-directed manned to achieve NASA's twenty-first century mission/science goals, including:***

- Robotic exploration of deep space
- Combined human-robotic exploration of Mars
- Safe and cost effective operation of the Space Shuttle and follow-on launch vehicles;
- Use of Earth-orbiting satellites to establish cause and effect relationships associated with such important phenomena as global warming

*Performance Goals:*

- Develop and demonstrate automated reasoning technologies that support the need to significantly increase the level of autonomy within NASA's future missions.
- Develop and demonstrate intelligent data understanding technologies that support NASA mission needs to automatically discover new information from large databases.
- Develop and demonstrate human-centered computing technologies which optimize the combined performance of human experts and the supporting information system.

# CICT Program Objectives

## - Seamless access to NASA resources -

***Enable seamless access to ground-, air-, and space-based distributed hardware, software, and information resources to enable NASA missions in aerospace, Earth science, and space science.***

Through this seamless access to NASA assets, scientists and engineers will be able to focus on making new discoveries in science, designing the next generation space vehicle, controlling a mission or developing new concepts for the National Airspace system rather than on the details of using specific hardware, software and information resources.

- *Performance Goal:*

  Develop and demonstrate:
  - Computing and communications testbed
  - Information grid services
  - information environments technologies

  for seamless and collaborative access to distributed ground-, air-, and space-based hardware, software, and information resources to significantly increase the performance of NASA missions.

# CICT Program Objectives
## - High-rate data delivery -

***Enable broad, continuous presence and coverage for high-rate data delivery from ground-, air-, and space-based assets directly to the users.***

High-rate data delivery is an enabling technology for NASA's twenty-first century missions, including:

- The Earth Science Enterprise Digital Earth Vision, in which all observing spacecrafts are in a distributed network to provide real–time multi-sensor information transfer directly to users.
- The HEDS Enterprise missions requiring multi-gigabit Internet-based communications in near-Earth orbit.
- The Space Science Enterprise missions requiring high rate communications from scientific spacecraft traveling to our outer planets and beyond in addition to intra-planetary networks for surface exploration.

•*Performance Goals:*

– Develop innovative component technologies for on-demand space data delivery enabling high data rates, broad coverage, internet-like data access that will vastly expand the presence of NASA's Enterprises on the Earth, in the air, and in space.

– Develop distributed communication architectures, networks, and technologies to provide broad coverage and intelligent-based real time data delivery from Earth, air, and space and to obtain and distribute information directly to the user.

# CICT Program Objectives
## - Strategic Research -

***Research, develop, and evaluate a broad portfolio of fundamental information and bio/nano-technologies for infusion into future NASA missions.***

Many of the missions in NASA's future will rely on technologies that are new and dramatically different from those in current practice today.

The challenges of deep space exploration, hostile environments, and remote science create a need for new technologies that employ new materials, smaller, lighter, and less power consuming devices, highly reliable software and reconfigurable computing and information technologies.

*Performance Goals:*

- Develop and evaluate high-confidence software, next-generation neural network algorithms, fault-tolerant reconfigurable computing platforms, biomolecular and nanoscale systems and tools, and other revolutionary technologies that support NASA's long-term mission needs.


# Major Program Deliverables (1 of 3)


- 2002: Human-centered computing Mars exploration rover study
  - Task analysis of planned Mars'03 mission operations with recommended improvements delivered to the Mars Science Operations Working Group
- 2003: Exploratory grid environment
  - Demonstrate Enterprise-relevant application operating on an exploratory grid environment providing access to heterogeneous ground-based resources at multiple geographical locations
- 2004: Simulated Autonomous science exploration mission
  - Conclusion of a successful analogue science mission (terrestrial rover or simulated spacecraft) demonstrating key autonomy technologies enabling goal-directed systems for science exploration missions
- 2004: Critical spacecraft networking technologies
  - Ground-based demonstration of spacecraft communications architecture, related protocols and software for internet-like space computing and communications

# Major Program Deliverables (2 of 3)

- 2005: Terrestrial grid technology implementation
  - Demonstrate grid technologies ready for integration into NASA operational environments.
  - Demonstrate relevant applications impacting 2 Enterprises operating on a ground-based grid environment providing access to heterogeneous resources at multiple geographical locations
- 2006: Integrated and adaptive space & terrestrial computing, communications, and information testbed
  - Demonstrate relevant applications impacting 3 Enterprises operating on hybrid space-terrestrial grid environments utilizing integrated ground-based grids, mobile resources, a distributed spacecraft testbed, wireless sensor network testbeds, and ad hoc network protocols
- 2007: Feature discovery from large, distributed, mixed format databases
  - Demonstrate capability to discover at an unknown feature from a large, distributed, mixed format database containing heterogeneous datasets

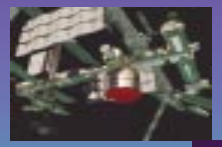
# Major Program Deliverables (3 of 3)

- 2007: New technology demonstration and transfer
  - Evaluate and promote 5 new bio, nano, or information technologies impacting at least 2 NASA Enterprises to a status appropriate for transfer to another NASA program or project, or insertion into a NASA mission.

# CICT Program Structure






## Intelligent Systems

*Enable smarter, more adaptive systems and tools that work collaboratively with humans in a goal-directed manner to achieve the mission/science goals.*

## Computing, Networking and Information Systems

*Provide seamless access to ground-, air- and space-based distributed computing, information, and knowledge to enable NASA missions in aerospace, Earth science and space science.*

## Space Communications

*Provide revolutionary space communications technologies*

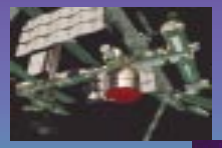
## IT Strategic Research

*Research, develop and evaluate a broad portfolio of fundamental information and bio/nano technologies for infusion into NASA missions.*

# CICT Program Structure






## Intelligent Systems

- *Automated Reasoning*
- *Human Centered Computing*
- *Intelligent Data Understanding*

## Computing, Networking and Information Systems

- *Grand Challenge Applications*
- *Information Environments*
- *Grid Common Services*
- *Advanced Computing and Com. Testbeds*

## Space Communications

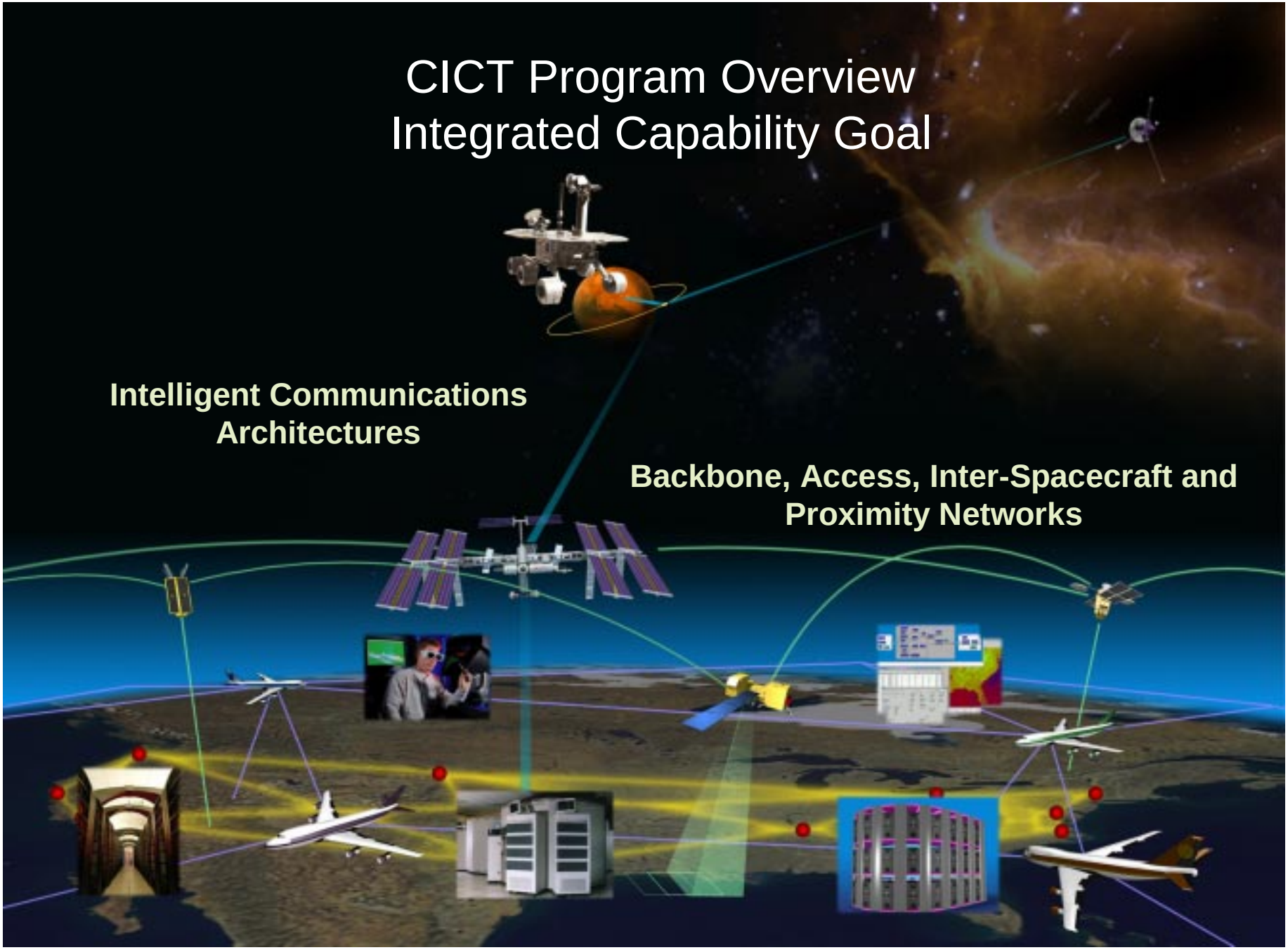
- *Intelligent Com. Arch.*
- *High Rate Backbone*
- *Flexible Access Net.*
- *Inter-spacecraft Net..*
- *Proximity Wireless Net.*

## IT Strategic Research

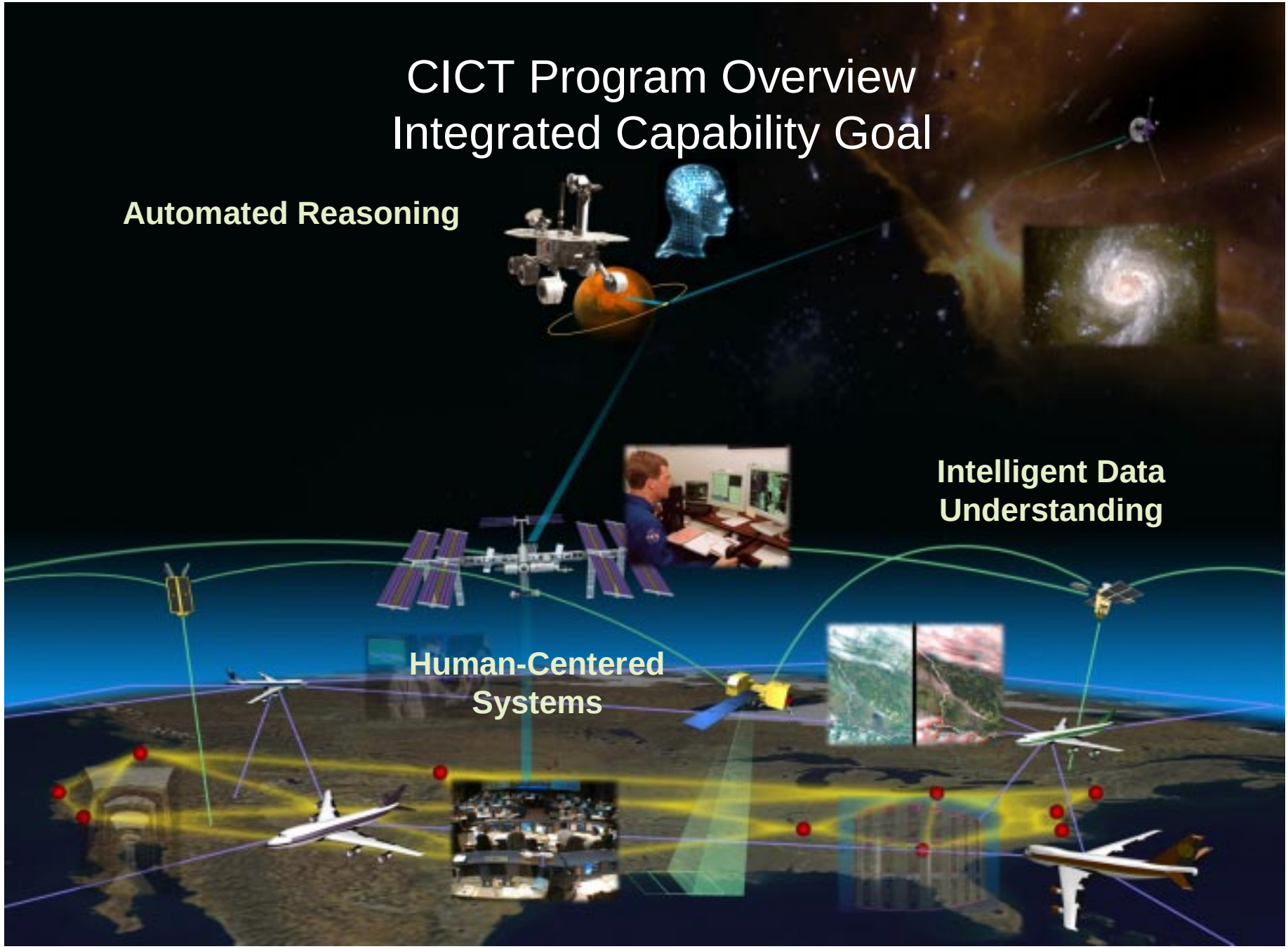
- *Bio/Nano Technologies*
- *Evolvable Systems*
- *Revolutionary Computing*
- *Intelligent Controls & Diagnostics*
- *High Confidence Software Technology*

# CICT Program Overview
# Integrated Capability Goal

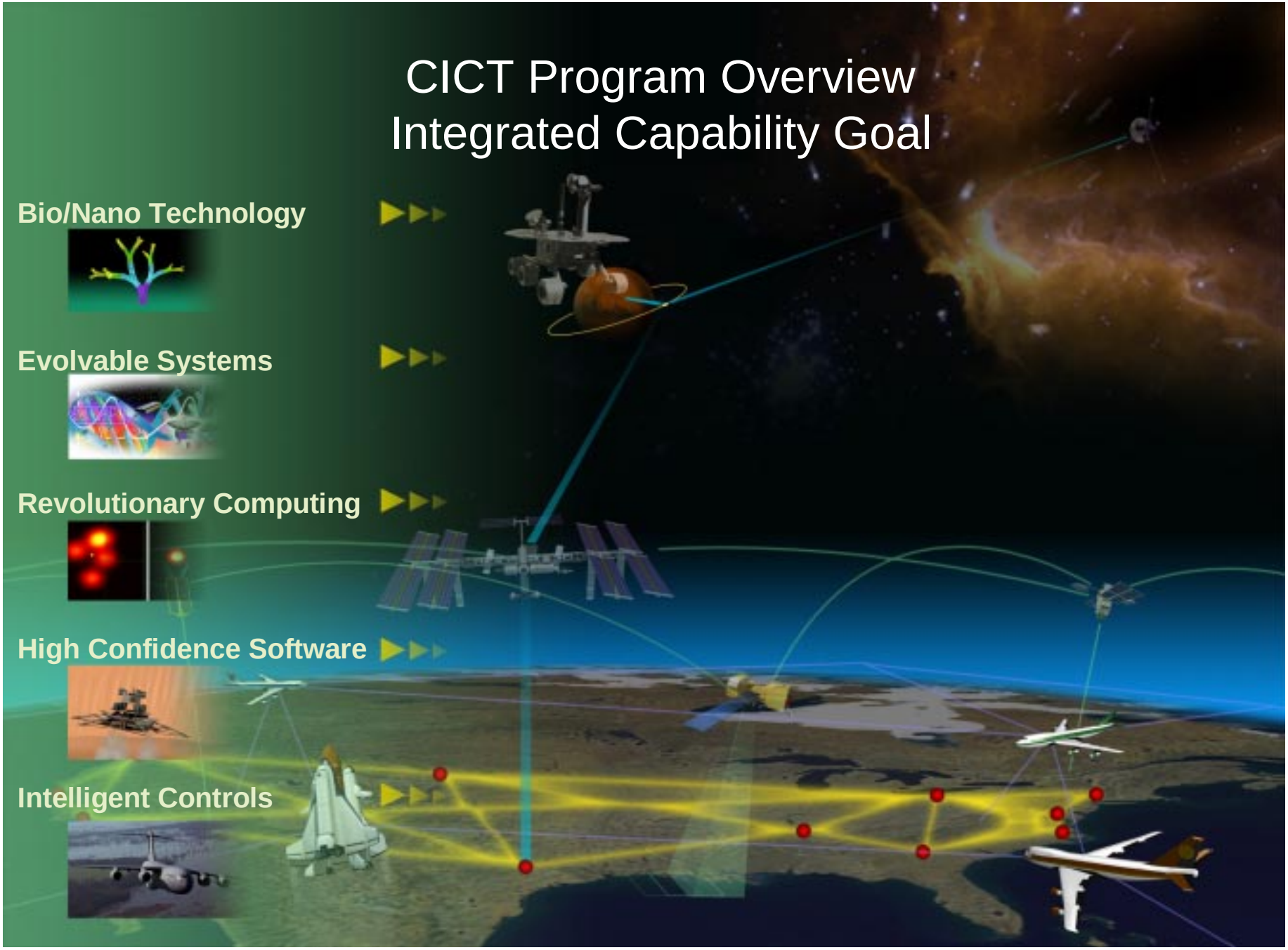
# CICT Program Overview
# Integrated Capability Goal



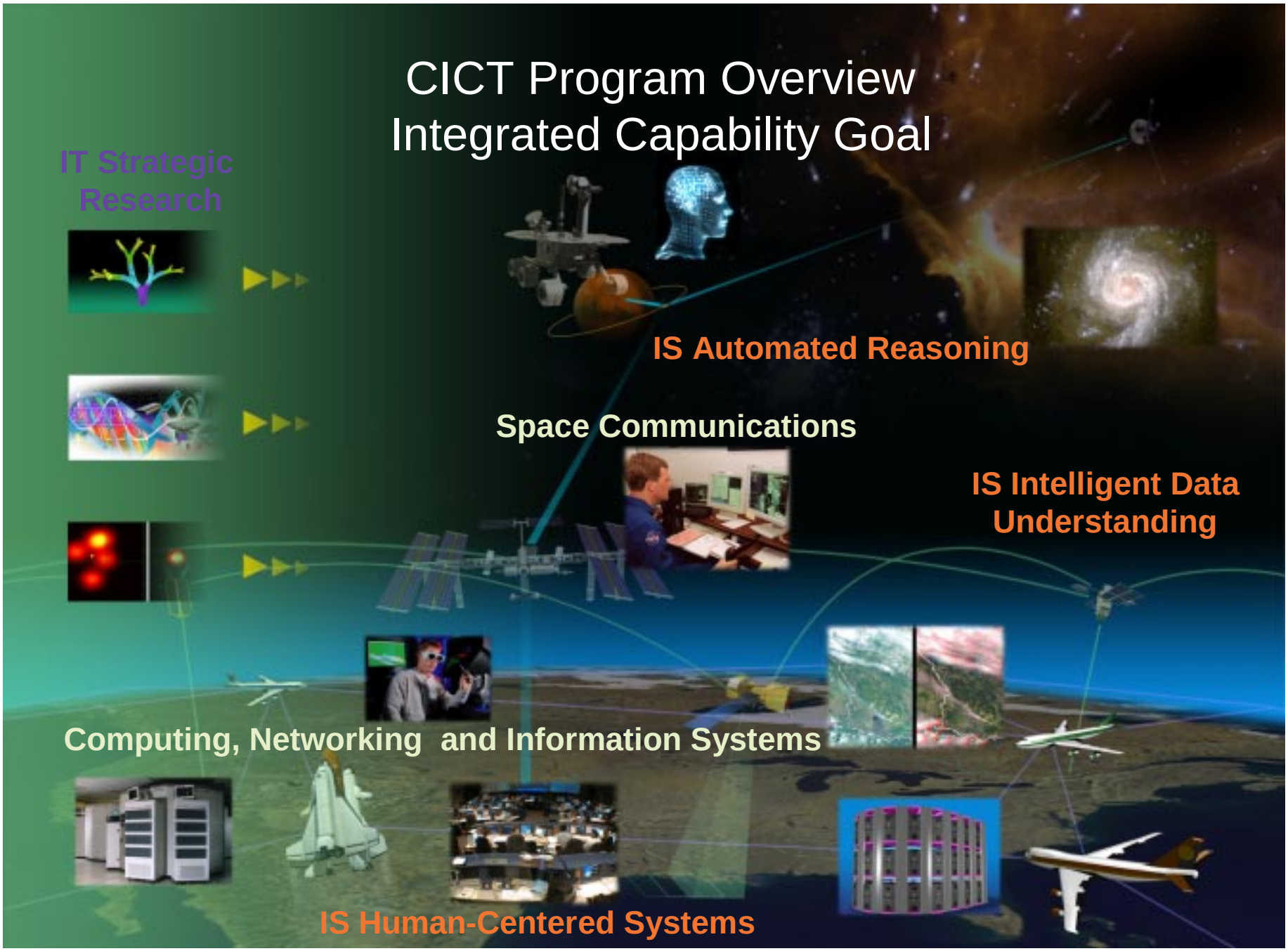
# CICT Program Overview
# Integrated Capability Goal



# CICT Program Overview
# Integrated Capability Goal



# CICT Program Overview
# Integrated Capability Goal

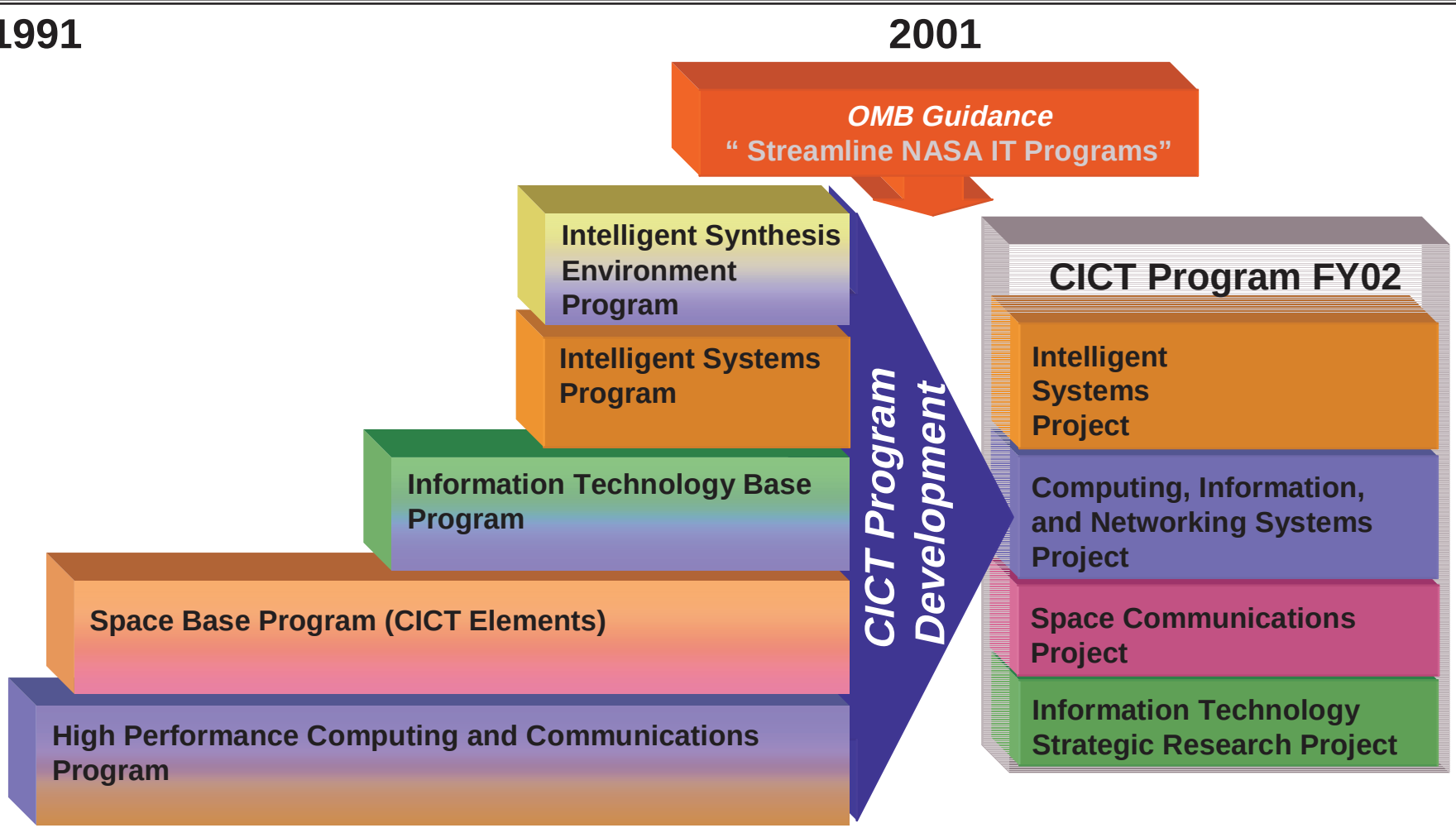


# CICT

# Investment Strategy
# Program Level Customers

COMPUTING
INFORMATION &
COMMUNICATIONS
TECHNOLOGY

# CICT Program
## - Historical Perspective -



# CICT Role In NASA Technology Flow

Earth & Space Industries

NASA Missions

NASA Cross-Enterprise CIC Requirements

Computing, Information, and Communications Industries

Aerospace Commercial Sector

NASA Mission Programs

CICT

Resources

3

6

TRL

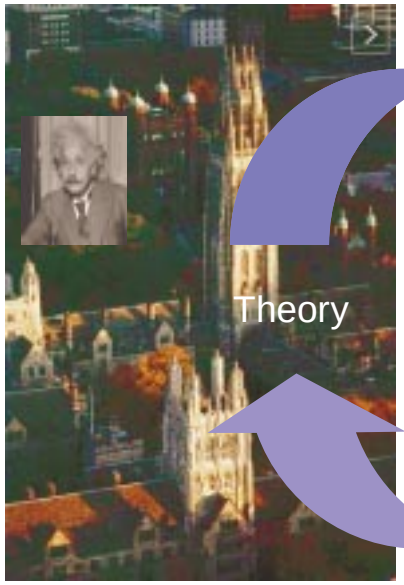
Emerging Fundamental Technologies

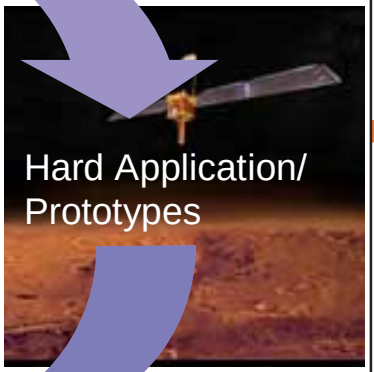
# CICT Technology

## - Requirements to Development to Infusion -

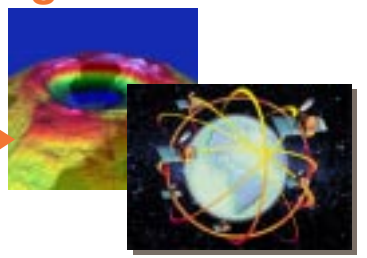
**NASA Requirements**

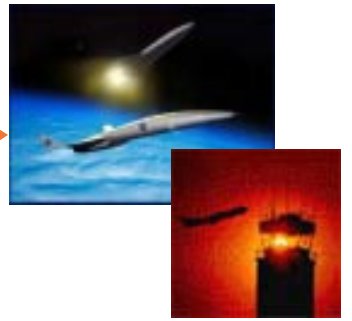
CICT Program

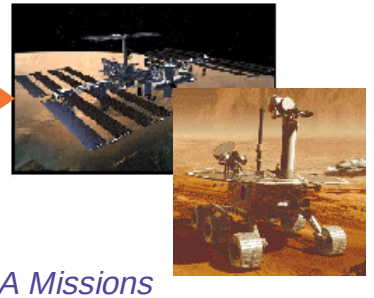



**NASA Mission Programs**







*Cross-Enterprise Requirements drive technology investment areas*

*Academia/NASA teams bring theory to bear on applications*

*NASA/Industry teams bring application to NASA missions*

*NASA Missions exploit technology, and update NASA requirements*

# CICT Technology

## - Requirements Definition Processes -

**NASA Requirements**

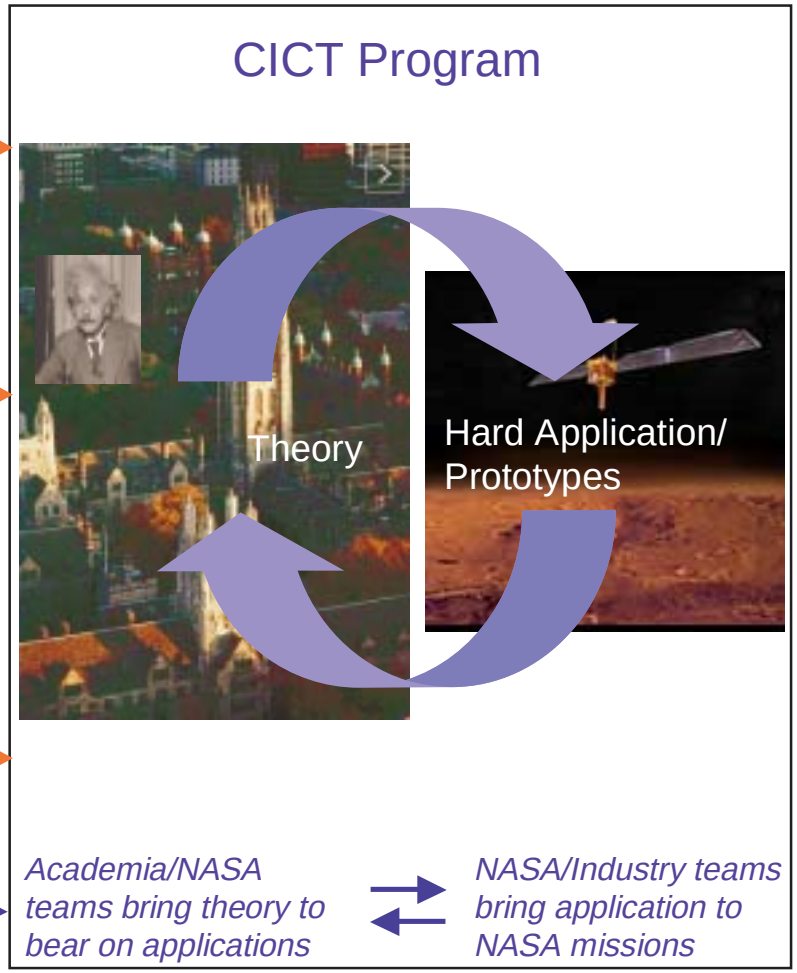
***Primary* Requirements Definition Processes**

- **Enterprise Strategic Planning**
  - **Enterprise Strategic Plans**
  - **IT Investments Evaluation**
    - **Code S Summer 01**
    - **Code Y Fall 01**

- **Enterprise CIC Requirements Processes**
  - **Mission Needs Council**
  - **Enterprise Workshops**
    - **PRT Dec 01 - Jan 02**
    - **IS Annual & Pre-NRA**
    - **SC Pre-NRA**

- **Enterprise Mission and CICT Joint Planning & Execution**
  - **Mars Missions**
  - **Climate Modeling**
  - **ISS Modeling and Training**
  - **Space Comm. Architectures**

*Cross-Enterprise Requirements drive technology investment areas*

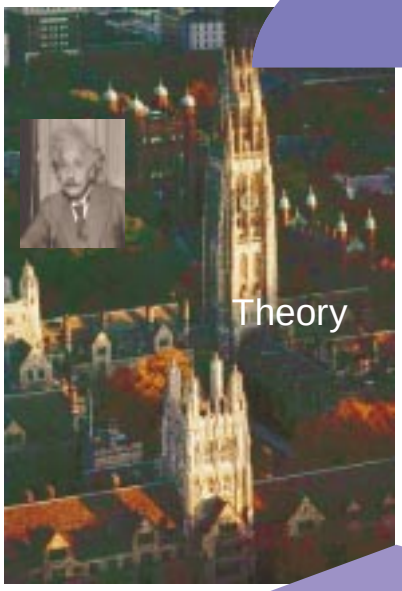


# CICT Technology

## - Technology Development Processes -

CICT Program

***Primary***
**Technology Development Processes**




- **Academia/NASA teams develop theory to individual prototype "brassboard" technology level (TRL 1-3).**
  - **Exploratory NRAs**
  - **IT Strategic Research**
    - **Bio/Nanotechnology**
    - **Evolvable Systems concepts**
- **NASA/Industry teams integrate "brassboard" technologies and work with target initial NASA mission applications**

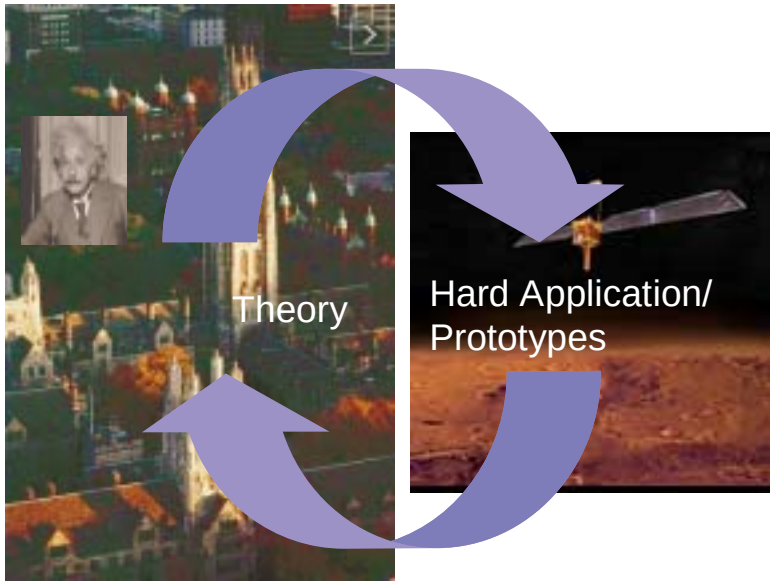

*Academia/NASA teams bring theory to bear on applications*

*NASA/Industry teams bring application to NASA missions*

# CICT Technology

## - Technology Infusion Processes -

### CICT Program

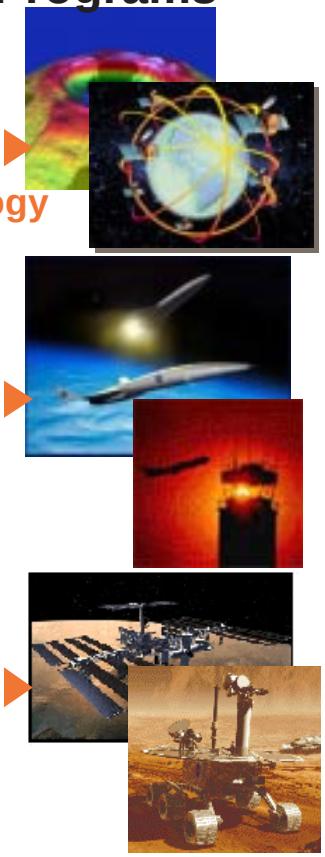



*Academia/NASA teams bring theory to bear on applications* ⇄ *NASA/Industry teams bring application to NASA missions*

### *Primary* Technology Infusion Processes

- **Target initial mission applications early in technology development process & work jointly with target Enterprise mission towards technology infusion:**
  - **IS**
    - **Mars '03 and '09 Missions**
    - **Earth Modeling Teams**
    - **Shuttle Operations**
  - **CNIS**
    - **Climate Modeling Teams**
    - **ISS and Shuttle Operations**
- **Once technology has been tested in a mission application, migrate to operational/commercial elements:**
  - **NASA operational elements**
    - **COSMO and SOMO**
    - **Mission Ops (Codes M & S)**
  - **Industry Sectors**
    - **Network & Space Comm.**
    - **High-Performance Computing**

### NASA Mission Programs



*NASA Missions exploit technology, and update NASA requirements*

# CICT
# Customers & Partners

| | NASA Mission Customers | National Commercial Sector | National Research Community |
|---|---|---|---|
| Intelligent Systems | OES, OSS<br>OAT, OSF | Aerospace & IT Industries and other NASA providers | Comp. Sci., Earth, and Space Science communities |
| Computing, Networking, and Information Systems | OAT, OES,<br>OSS, OSF,<br>NASA IT Ops. Orgs. | Aerospace & IT Industries and other NASA providers | Earth and Space Science communities |
| Space Communication | OSS, OES, OSF, OAT | Aerospace, satellite, and wireless comm. Industries | |
| Information Technology Strategic Research | OAT, OES, OSS, OSF | Aerospace & IT Industries and other NASA providers | Comp. Sci., Biological, and Nanotechnology communities |

OAT - Aerospace Technology Enterprise
OES - Earth Space Enterprise
OSS - Space Science Enterprise
OSF - Human Exploration and Development of Science

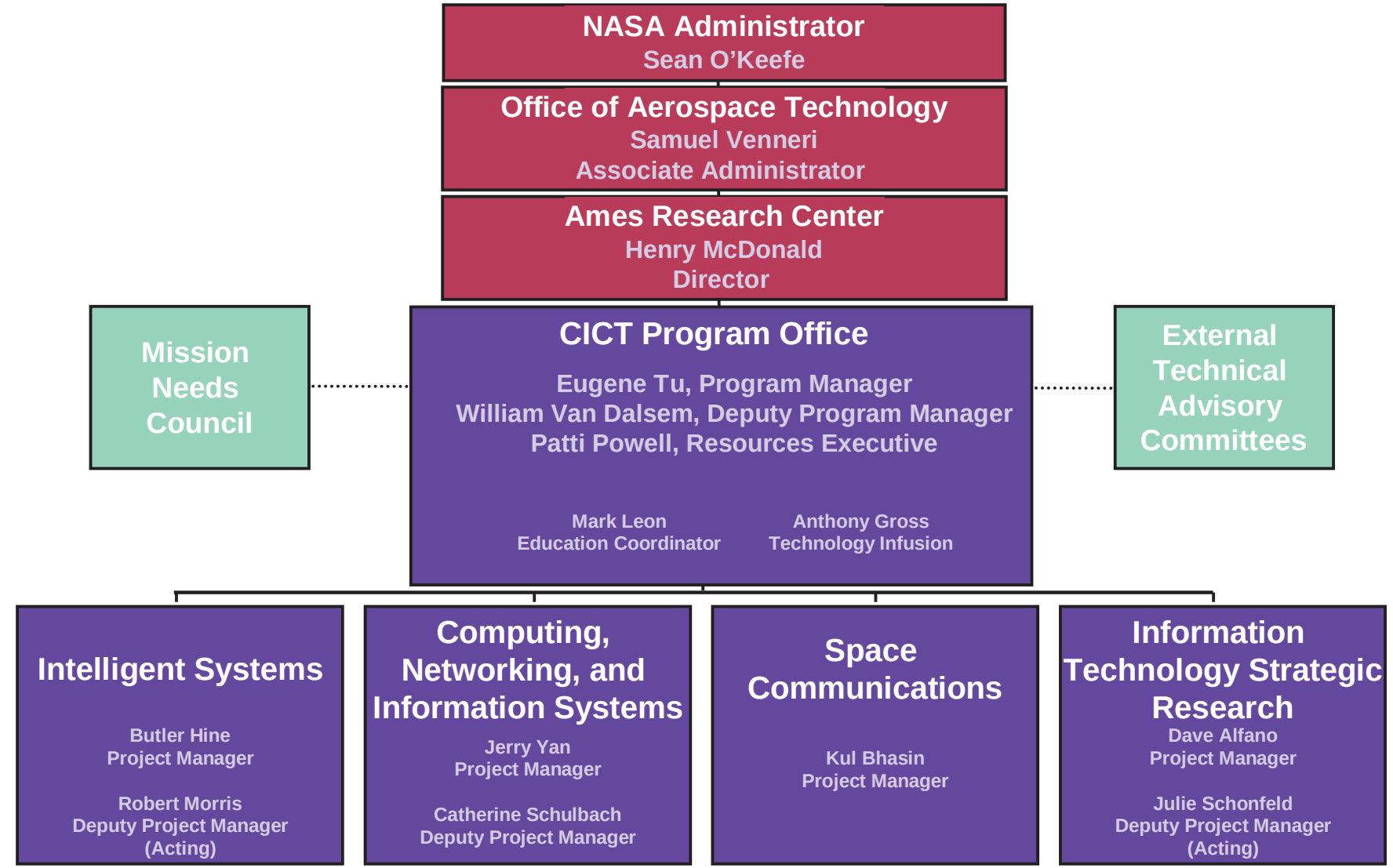
Red - Primary Technology Customer (Driving Requirements)
Blue - Technology Customer
Black - Technology Beneficary and/or Partner

# CICT

# Organization
# Management Structure
# Program-level Processes

COMPUTING
INFORMATION &
COMMUNICATIONS
TECHNOLOGY

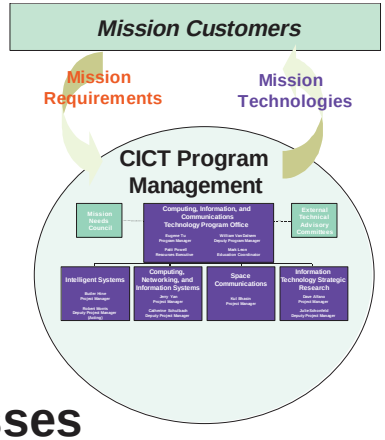
# CICT Management Structure



# CICT Management Functions

# Mission Customers

## Mission Requirements:

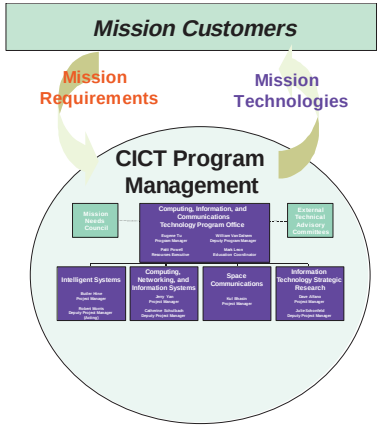



- **Monitor Enterprise Strategic Activities**
  - **Enterprise Strategic Planning**
    - Enterprise Strategic Plans & Congressional Testimony, for example
  - **Advanced Technology Planning Organizations and Products**
    - ESTO for the Earth Science Enterprise, for example
    - Code S IT Investment Study (Summer 2001), for example
- **Initiate Enterprise CIC-Specific Requirements Processes**
  - **Mission Needs Council**
    - Recommends mid- and long-term technology investments
      - Identify new requirements based on evolving NASA missions
      - Support trade studies used to maintain balanced technology portfolio
  - **Joint Technology Planning and Review**
    - Multi-Enterprise competitive NRA strategy, relevance, and selection processes
      - IS/Multi-Enterprise NRA Strategy, Relevance, and Selection Meetings — Sept 00-Jan 01
      - SC/National Space Communications Requirements Meetings — March-April 02
- **Enterprise Mission and CICT Joint Planning & Execution**
  - **Target Initial Mission Applications (Requirements evolve from joint planning)**
    - Mars Missions (MER03 and MSL)
    - Climate Modeling (Goddard Space Flight Center and National Climate Modeling Community)
    - ISS Modeling and Training (International Space Station development and operations team)

# Mission Customers

## *Mission Technologies :*

- **Enterprise Mission and CICT Joint Planning & Execution**
  - **Target Initial Mission Applications (Technology evolves during joint execution)**
    - Mars Missions
    - Climate Modeling
    - ISS Modeling and Training



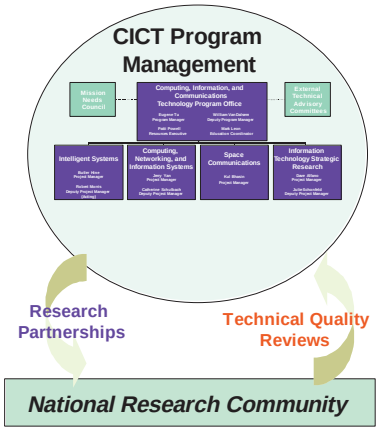

- **Once technology has been tested in a mission application, migrate to operational NASA elements and/or the appropriate commercial sectors**
  - **NASA operational elements**
    - COSMO and SOMO
    - Mission Operations (Code M & S)
  - **Industry Sectors**
    - Ground-based networking and space communications
    - High-performance computing

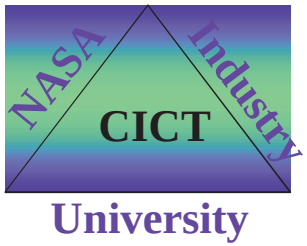
# National Research Community

## *Research Partnerships:*

**Work distributed through competitive selection**

- **Academic**
  - **Basic R&D**
    - Encourage co-PIs from NASA/Industry
- **NASA**
  - **Basic R&D uniquely supported by NASA core competency**
    - Encourage co-PIs from Academia
  - **NASA mission technology demonstrations**
    - Encourage teaming with Industry for technology maturation
- **Industry**
  - **Demonstration and maturation**
    - Encourage teaming with NASA for technology maturation




## *Technical Quality Reviews:*

**All work evaluated for technical quality:**

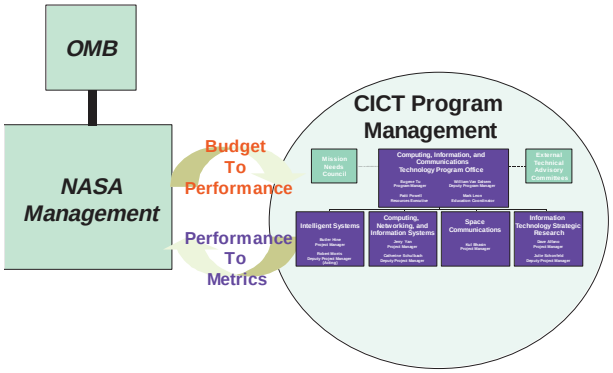
| | | |
|---|---|---|
| • NRC Review | - 3 year cycle | - Technical |
| • ASTAC Reviews | - Annual | - Technical/Relevance |
| • IAR Reviews | - Annual | - Programmatics/Technical |
| • Performing Organization Peer Reviews | - Annual | - Technical |
| • NRA Selection and Status Reviews | - As appropriate | - Technical/Relevance |

# NASA Management

## *Performance to Metrics:*

**Progress against established metrics and milestones reviewed annually**

- **Mission impact and Technology Metrics**
  - **Mission impact measures**
  - **Technology metrics**
- **Hierarchical Milestone Structure and Monitoring**
  - **Hierarchical milestone structure (GPRA-PCA-Program-Project-Task)**
    - **Minimum and target success criteria established for all milestones**
  - **All milestones monitored for completion on schedule within cost**
    - **Milestone performance monitored at all levels**
    - **Cost plans established and actual costs monitored against plan**




## *Budget to Performance:*

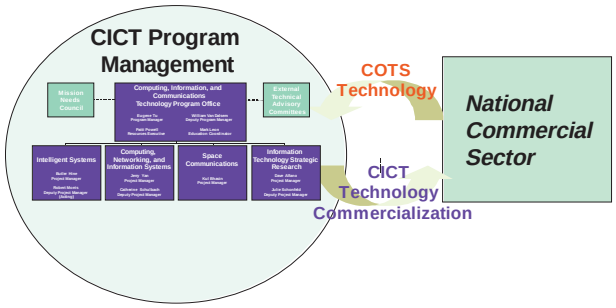
**Annual budget allocation process based on:**

- **Performance against metrics and milestones**
  - **Go/no go decision points defined for each technology**
    - **R&D, Component Development, Mission Demonstration**
- **Technical quality evaluation**
- **Projections of:**
  - **Mission needs, including ROI analysis**
  - **Technology portfolio balance**
  - **Risk balance**

# National Commercial Sector

## CICT Technology Commercialization:

- "Seeding" revolutionary new technologies which will fuel the next economic growth cycle:
  - Biologically-inspired and nano-technologies
  - Evolvable and adaptive systems
- Support emergence of new service industries based on new technologies or NASA data:
  - Ad-hoc wireless networking
  - Internet-based NASA data (Earth systems) sharing
- Drive the continued advancement of "highly-commercializable" artificial intelligence, high-performance computing, and collaboration technologies to support decision-, computing-, and data-intensive scientific and engineering endeavors:
  - Advanced artificial intelligence algorithms
  - System software for high-performance computing systems
  - Network services (QoS and Multicasting technologies)
  - Grid middleware software
  - Space communications architectures and components
  - Automated software enginnering technologies

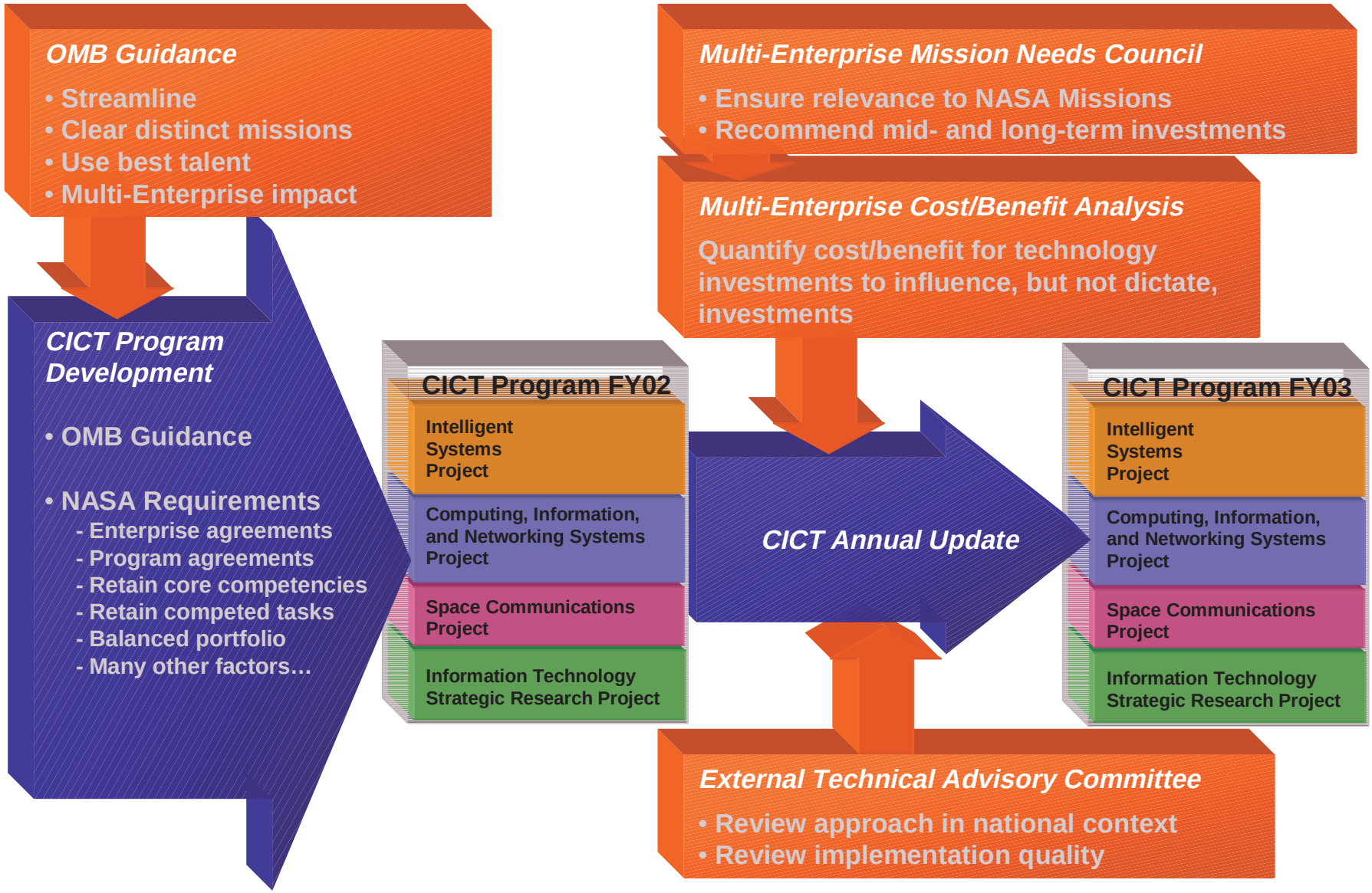



## COTS Technology:

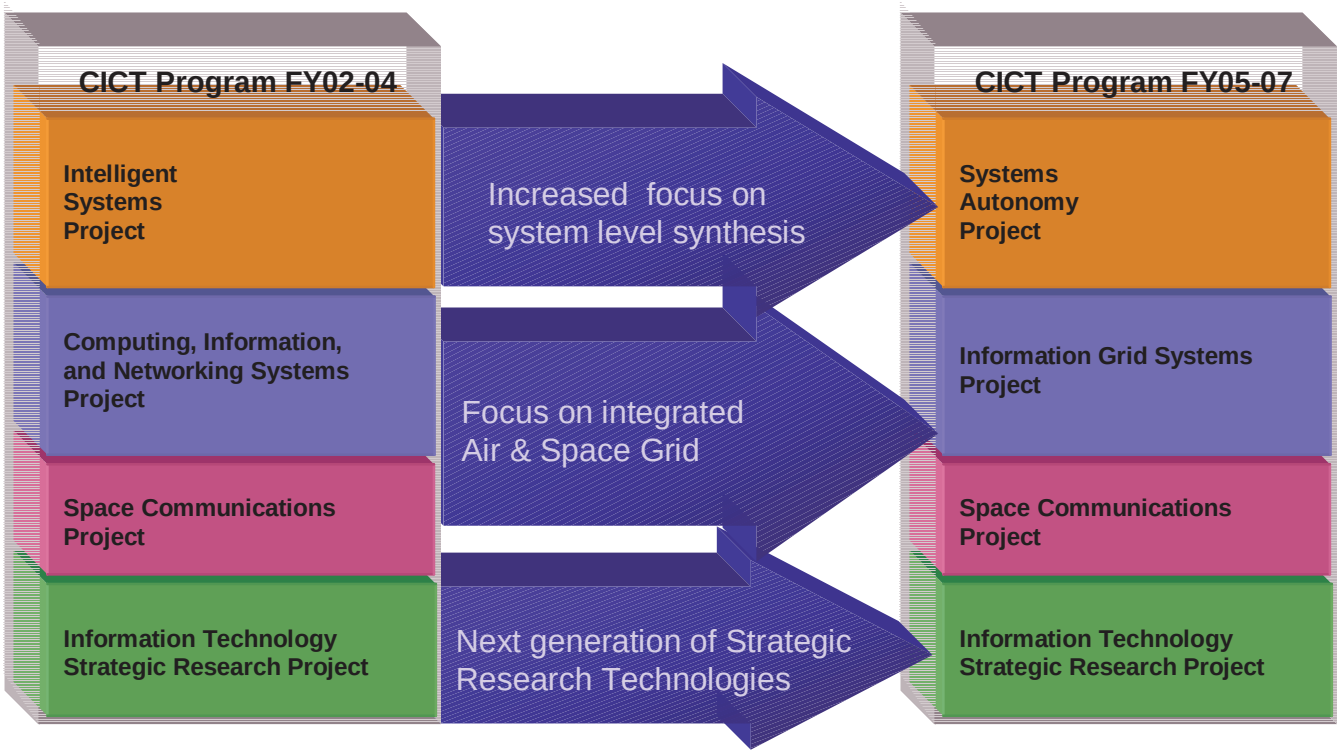
COTS technology always evaluated for use, and typically used as baseline in many areas:

- Collaboration technologies
- Networking infrastructure
- Ground-based high-performance computing

# CICT Program
# - Development and Annual Update -



# CICT Program
# - Project Maturation Plans -



# CICT

# Schedule
# Budget

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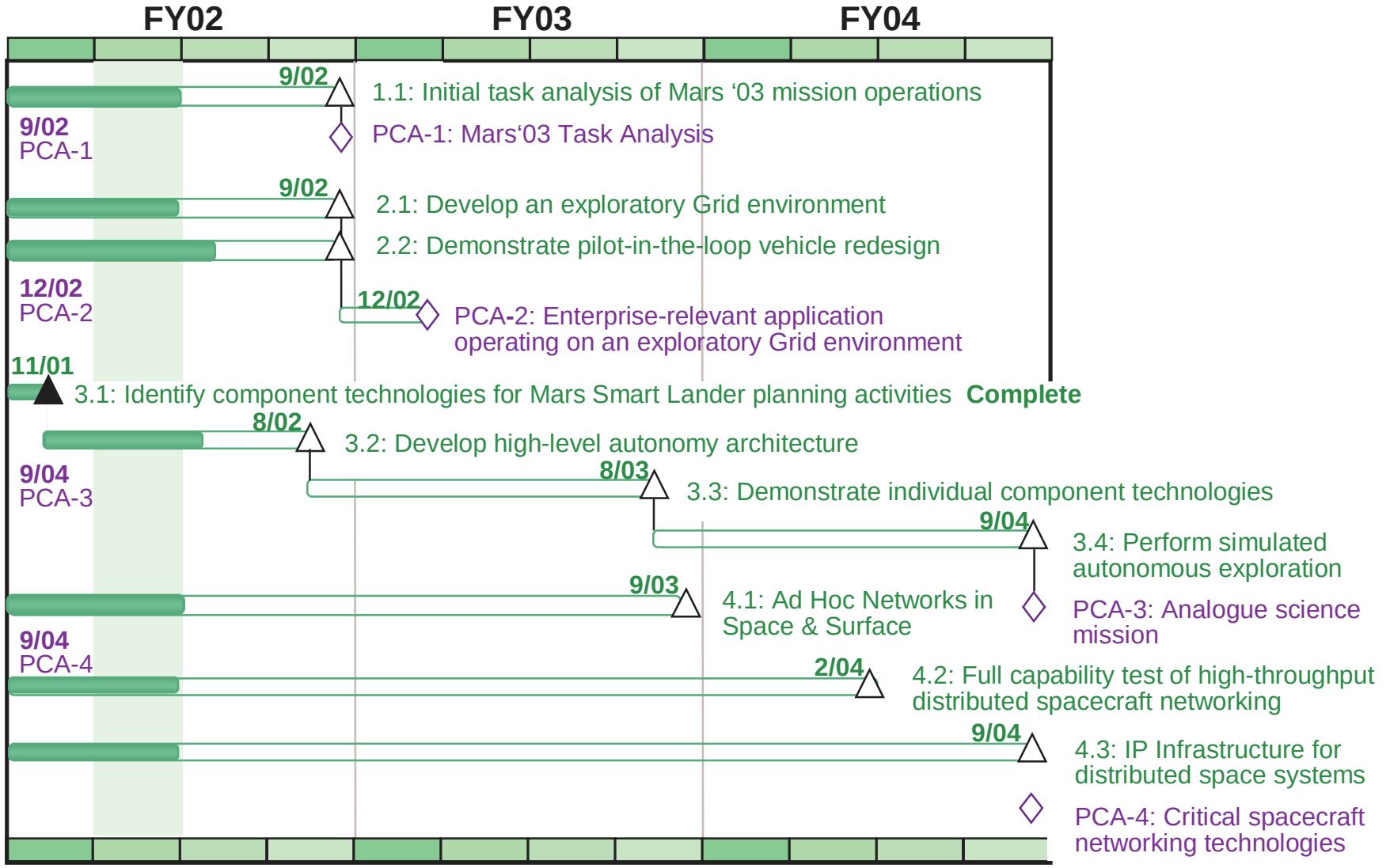
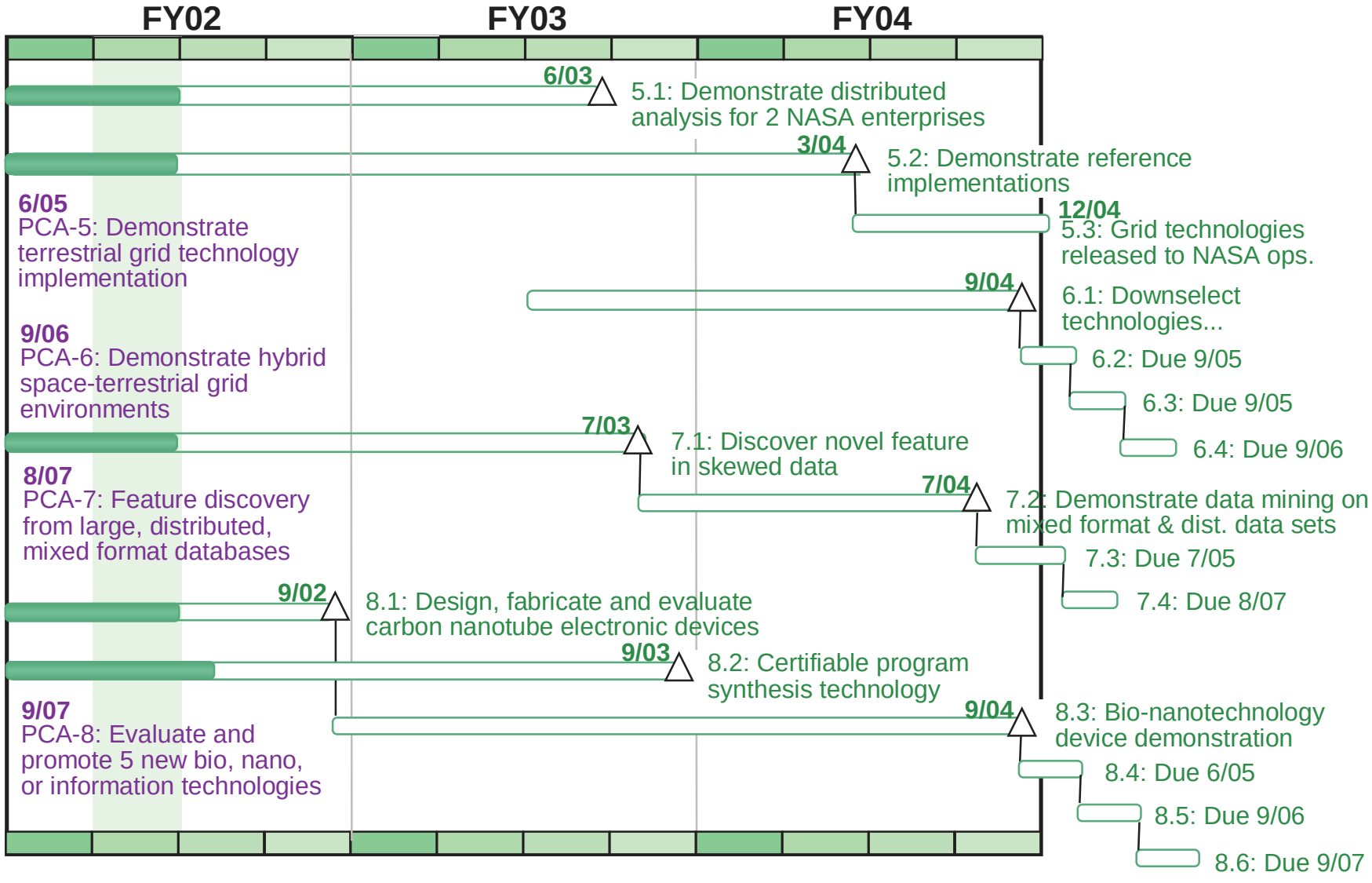
# CICT PCA/Program FY02-04 Milestones



# CICT PCA/Program FY02-04 Milestones



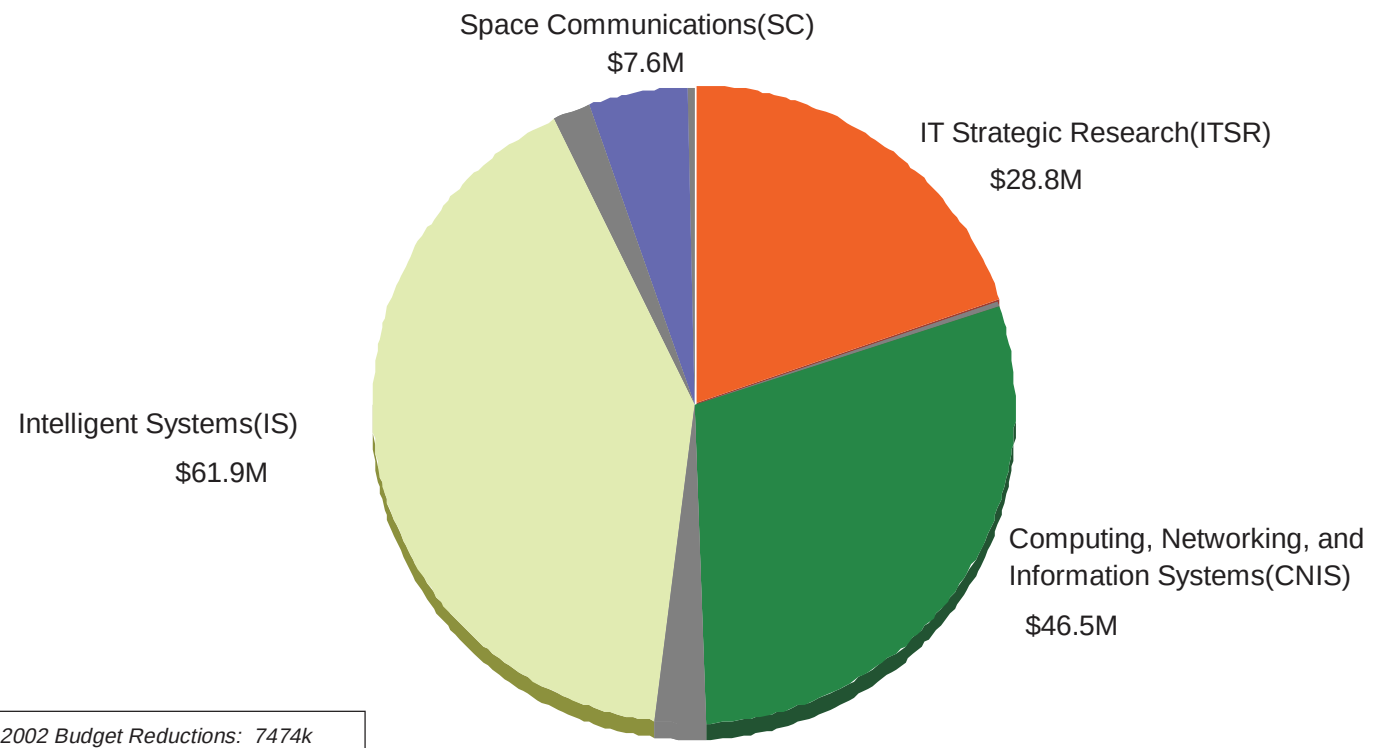
# Detailed Milestone Schedule

- PCA and Program Level milestones, due dates and metrics

# Budget Charts

- CICT budgets by Projects by fiscal year (03-08)
- CICT workforce by Projects by fiscal year (03-08)
- CICT budgets by performer
  - NASA, JPL, Academia, Industry, and other Gov't orgs
- CICT budgets by mechanism
  - Sole source
  - NASA reviewed (e.g. institutional, PBCs)
  - Openly competed peer reviewed (e.g. NRAs, BAAs)

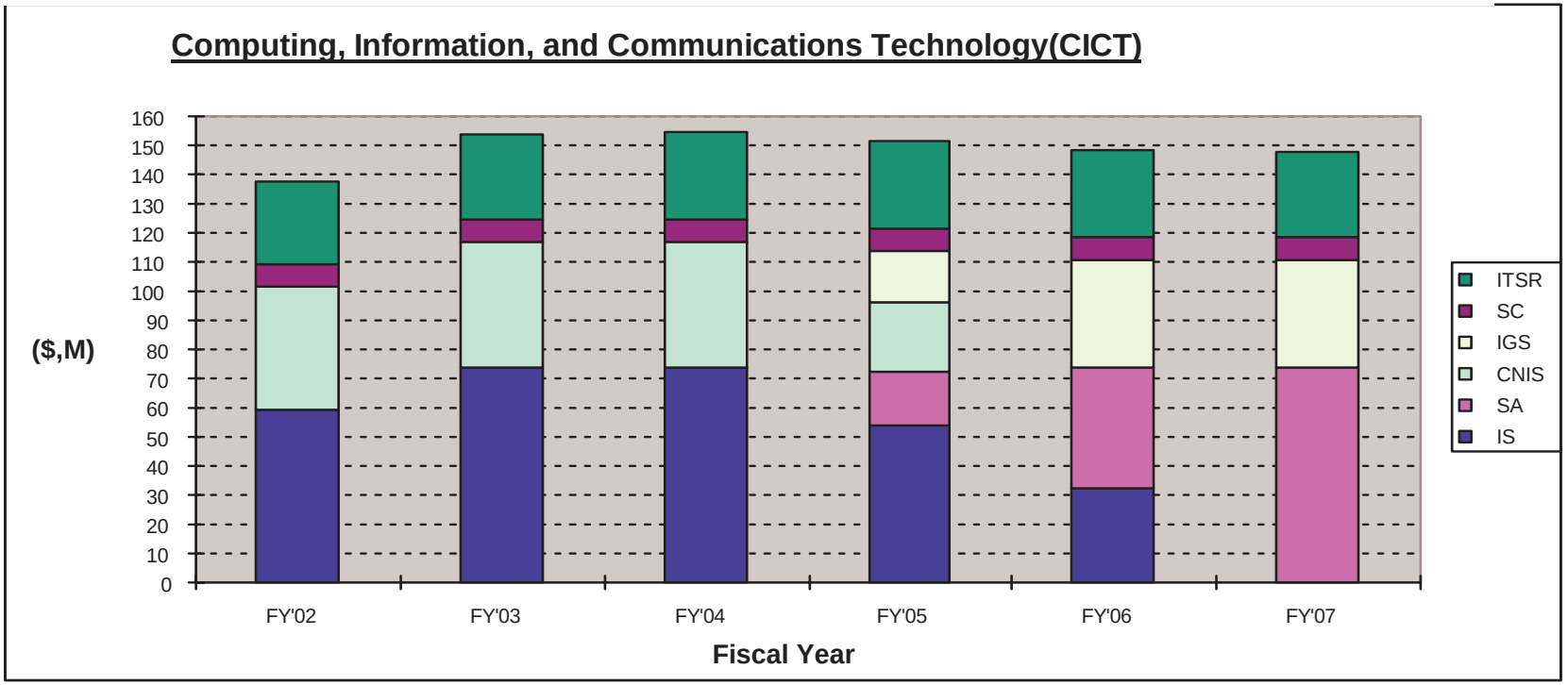
# CICT Program FY02 Budget




*FY 2002 Budget Reductions: 7474k*
*ITSR 417K*
*CNIS 3490K*
*IS 3008K*
*SC 560K*

Note: Budget numbers do not include earmarks

# CICT Program FY02-FY07 Budget




**Budget by Project** **($,M)**

| Project | Current Year FY'02 | CY+1 FY'03 | CY+2 FY'04 | CY+3 FY'05 | CY+4 FY'06 | CY+5 FY'07 |
|---|---|---|---|---|---|---|
| IS | 59.1 | 73.6 | 73.8 | 54.2 | 32.4 | - |
| SA | | | | 18.2 | 41.3 | 73.8 |
| CNIS | 42.7 | 43.1 | 42.8 | 23.7 | - | - |
| IGS | | | | 17.5 | 37.0 | 36.9 |
| SC | 7.1 | 7.6 | 7.6 | 7.6 | 7.6 | 7.6 |
| ITSR | 28.4 | 29.7 | 30.1 | 30.3 | 29.7 | 29.5 |
| Total | 137.3 | 154.0 | 154.3 | 151.5 | 148.1 | 147.9 |


NASA


AT

# Backup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# CICT Program - FY02
## - Customer Enterprises -